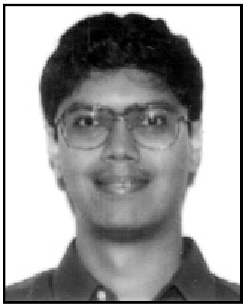
SE4 Automotive Signal Processing Technologies



Organizer: Toru Shimizu, Renesas, Tokyo, Japan
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The automobile has become much more than a means of traveling from point A to point B. Today's automobiles are complex signal processing environments that bring together a wide variety of innovative systems including user friendly interfaces, multimedia content delivery, real-time sensing / control, and networking. This special-topic session presents some of the exciting trends and emerging technologies for future automotive signal processing systems. In this session, experts will describe (i) some of the emerging trends and semiconductor technologies for future automotive electronics, (ii) test methodologies for safety-critical automotive applications, (iii) signal and media processing technologies for engine control and car information systems, and (iv) vision processing architectures for advanced driver assistance systems.

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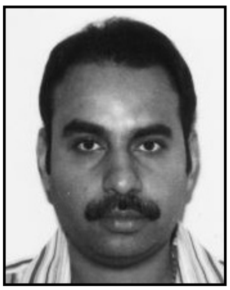
Panelists Statements

Future Semiconductor Technologies for next Generation Car Electronics

Masayuki Hattori, Toyota, Aichi, JAPAN

Recent Automotive systems have been required for the high performance in the environment, the safety, the security and car entertainments. Toyota has developed Hybrid Vehicle technologies, the pre-crash safety system, VDIM (Vehicle Dynamics Integrated Management system) and G-Book to meet these requirements. Advanced electronics technologies, for example high performance LSIs and Jisso technologies, used in automotive electronic systems are key factors to develop the future cars with the perfect safety drive, the low fuel consumption and the clean exhaust gas. We car manufacturers need the development of semiconductors, electronic parts and these manufacturing techniques to design increasing large systems. In fact, the newly developed car has made by using the state of the art electronics technologies. A demand of a miniaturization and a low cost system is particularly strong in car electronics systems and the highest electronics technologies that can be used under severe automotive environment conditions are very important rule to make next generation cars.



CPU Application Self test Using Logic Bist for Automotive Devices

Hari Pendurty, Texas instruments, Houston, TX

Safety critical automotive applications, such as anti-lock brake controllers, require a self test with high test coverage numbers of CPU cores while the application is running. The challenge is to minimize the size of memory and CPU cycles required to run self-test while system is running. Built In Self Test (BIST) controller is added next to the CPU. The controller includes a ROM for storing patterns and control words, a state machine to control ROM access, shift registers, signature compare logic and control registers which the CPU can access via its memory map. The BIST controller is a better solution than the self-test running on the CPU. The Bist controller achieves high test coverage with any fault model, provides the best solution for test coverage vs test time vs pattern size, simplifies the fault grading process and provides an at-speed internal shift based on the on-chip PLL. The BIST controller isolates the CPU from the rest of the system during self-test and enables other masters to run in parallel with the self test. This methodology can support high speed burn-in and massively parallel testing.

The Micro-Brains and Muscles for the Automotive Electronics

Toru Baji, Renesas, Tokyo, Japan

A lot of MCUs and DSPs are used in a wide range of automotive applications, such as car audio & information systems, dashboard & body safety equipments, engine control, chassis control, etc. This presentation will focus on the two application areas where a higher level of signal processing is applied. In the engine control, the fuel efficiency and tight gas emission control demands for a higher signal processing capability. The low power consumption, low EMI, smaller package and the operation under severe environment are also the requirements. In the car information systems, enhancement of media processing like the terrestrial TV broadcast reception, enhancement in the road map display from 2D graphics to 3D, and the upcoming driving assist are some of the requirements. Multi-processor is one of the essential technologies, but for further efficiency in signal processing, application optimized signal processors are also important. Some reconfigurable processors will also be introduced.

Vision Processing for Advanced Driver Assistance Systems

Kurt Sievers, NXP Semiconductors, Hamburg, Germany

In order to improve road safety, modern cars are increasingly equipped with advanced driver assistance systems (ADAS). Those systems readily use radar, lidar ultra-sonic and infra-red technologies, but true object recognition is only possible using camera sensors. Processing the camera input signals at high frame rates is an extremely complex task, that goes beyond the power of the average general purpose DSP. Vision processing architectures are needed that provide the paralalism and dedicated vision instruction pipelining required for applications like lane departure warning, traffic sign recognition or head beam assist. We developed a vision processor architecture combining a camera input processing unit with a vision control processor and an ARM9 control processor. This architecture provides 30 GOPS of horse-power in a highly integrated form factor, allowing ADAS to penetrate fast in the volume segments of the car market.